Calendar No. 891

100TH CONGRESS
2d Session

SENATE

REPORT
100-473

STATE MINING AND MINERAL RESOURCES RESEARCH INSTITUTE PROGRAM

AUGUST 10, 1988.—Ordered to be printed

Mr. JOHNSTON, from the Committee on Energy and Natural Resources, submitted the following

REPORT

[To accompany H.R. 3977]

The Committee on Energy and Natural Resources, to which was referred the Act (H.R. 3977) to authorize appropriations for the Mining and Mineral Resources Research Institute Act for fiscal years 1990 through 1993, having considered the same, reports favorably thereon with an amendment and recommends that the Act, as amended, do pass.

The amendment is as follows:

Strike out all after the enacting clause and insert in lieu thereof the following:

That any reference in this Act to the "Act of August 29, 1984", is a reference to the Act of August 29, 1984, entitled "An Act to establish a State Mining and Mineral Resources Research Institute Program, and for other purposes" (30 U.S.C. 1221-1230; 98 Stat. 1536-1542).

SEC. 2. (a) Section 1(a)(1) of the Act of August 29, 1984 (30 U.S.C. 1221(a)(1)), is amended by striking "$300,000 for the fiscal year ending September 30, 1985, and" and "to each participating state" and inserting after "$400,000" the following: "for the fiscal year ending September 30, 1990, and".

(b) Section 1(a)(2)(A) of the Act of August 29, 1984 (30 U.S.C. 1221(a)(2)(A)), is amended to read as follows:

"(2)(A) Funds appropriated under this section shall be made available for grants to be matched on a basis of no less than two non-Federal dollars for each Federal dollar.".

(c) The second sentence of section 1(b) of the Act of August 29, 1984 (30 U.S.C. 1221(b)), is amended by deleting the phrase "production of mineral resources;" and inserting in lieu thereof "production of fuel and nonfuel mineral resources;".

SEC. 3. Subsection 2(a) is amended by deleting the second sentence and amending the first sentence to read as follows: "There is authorized to be appropriated to the Secretary $15,000,000 for the fiscal year ending September 30, 1990, and for each

S313-40

fiscal year thereafter for four additional years, which shall remain available until expended.".

SEC. 4. Section 6(d) of the Act of August 29, 1984 (30 U.S.C. 1226(d)), is amended by striking "after September 30, 1984,".

SEC. 5. (a) Section 9(a)(7) of the Act of August 29, 1984 (30 U.S.C. 1229(a)(7)), is amended to read as follows:

"(7) seven other persons who are knowledgeable in the fields of mining and mineral resources research, including two university administrators involved in the conduct of programs authorized by this Act, three representatives from the mining industry, a working miner, and a representative from the conservation community. In making these seven appointments, the Secretary shall consult with interested groups.".

(b) Section 9(e) of the Act of August 29, 1984 (30 U.S.C. 1229(e)), is amended by deleting the second sentence and inserting in lieu thereof the following: "The Committee shall submit such plan to the Secretary, the President, and the Congress on or before March 1, 1986, and shall submit an annual update of such plan by January 15 of each calendar year.".

SEC. 6. Section 10(b) of the Act of August 29, 1984 (30 U.S.C. 1230(b)), is amended to read as follows:

"(b) Notwithstanding the provisions of subsection (a), those colleges or universities which, on the date of enactment of this Act, have a mining or mineral resources research institute program which has been found to be eligible pursuant to this Act shall continue to be eligible pursuant to this Act subject to review at least once during the period authorized by this Act, under the provisions of section 10(a) of this Act.".

SEC. 7. The Committee on Mining and Mineral Resources Research established under Section 9 of the Act of August 29, 1984 (30 U.S.C. 1229) shall submit a proposal to establish a Generic Mineral Technology Center on Strategic and Critical Minerals to the Congress by January 15, 1990. Such proposal may be submitted in conjunction with the annual plan update required by section 9(e) of the Act of August 29, 1984 (30 U.S.C. 1229(e)).

PURPOSE OF THE MEASURE

H.R. 3977, as amended and recommended by the Committee, amends Public Law 98-409, an Act to establish a State Mining and Mineral Resources Research Institute program, to reauthorize the program for fiscal years 1990 through 1994. H.R. 3977 authorizes to be appropriated funds for state allotment grants for each qualified mineral institute and research funds for specific mineral research projects. H.R. 3977, as amended, increases from six to seven persons the non-federal membership of the Committee on Mining and Mineral Resources Research and requires the Committee to submit the annual updated national plan for mining and mineral resources research by January 15 of each year. The measure also provides that those institutes which, on the date of enactment of this Act, had eligible research programs in place shall retain their eligibility subject to review during the period authorized by the Act.

BACKGROUND

The State Mining and Mineral Resources and Research Institutes program was first authorized by Title III of the Surface Mining Control and Reclamation Act of 1977 (Pub. L. 95-87, 30 U.S.C. 1221-1229). In 1984, Public Law 98-409, an Act to establish a State Mining and Mineral Resources Research Institute program, reauthorized the program until September 30, 1989. The purpose of the mineral institutes program is to stimulate research and training of engineers and scientists in mining and minerals resources and technology through establishment of institutes in colleges and universities meeting certain criteria.

Public Law 98-409 currently provides for grants and research funds for designated mineral institutes at one public college or university per state. Eligibility criteria provided for in that Act include the presence of a substantial graduate program in mining; evidence of institutional commitment to, and industrial cooperation in, the program; and the presence of an accredited engineering program in mining or the equivalent institutional capability.

Public Law 98-409 provides for allotment grants to each participating institute and requires allotment grant matching on the basis of 2 non-federal dollars for each federal dollar for fiscal years 1987, 1988 and 1989. In addition to allotment grants, that Act authorizes research grants for specific mineral research and demonstration projects.

Public Law 98-408 established a Committee on Mining and Mineral Resources Research that reviews all funding applications and makes recommendations to the Secretary on mineral research. Additionally, that Act requires that the Committee develop a national plan for research in mining and mineral resources.

There are currently 32 mineral institutes. Research grants are currently made through generic mineral technology centers in which some of the 32 institutes participate. The centers currently focus their research in five primary areas: mine systems design and gound control; communication; pyrometallurgy; mineral industry waste treatment and recovery; and respirable dust.

Legislative History

S. 2240 was introduced on March 31, 1988 by Senator Johnston and cosponsored by Senators, Burdick, Conrad, Domenici, Melcher Symms, Warner, Simpson, McCain, Shelby, Bingaman, and Hecht. On June 27, 1988 the Subcommittee on Mineral Resources Development and Production held a hearing on the measure.

On February 18, 1988, H.R. 3977 was introduced by Congressman Rahall and cosponsored by Congressmen Udall, Emerson, Vento, Richardson, Sabo, Craig, Owens of New York, Weiss, Flippo, Gray of Illinois, Vucanovich, Davis of Michigan, Skeen, Rangel, and Johnson of South Dakota. The bill was ordered to be reported as amended by the Committee on Interior and Insular Affairs on April 20, 1988 (Report No. 100-581). On May 23, 1988, H.R. 3977, as amended, was passed by the House of Representatives. On May 24, 1988, the Act was received in the Senate and referred to the Committee on Energy and Natural Resources with subsequent referral to the Subcommittee on Mineral Resources Development and Production.

The Committee having considered S. 2240, ordered reported H.R. 3977 with an amendment in the nature of a substitute incorporating the text of S. 2240, as amended.

Committee Recommendation and Tabulations of Votes

The Senate Committee on Energy and Natural Resources, in an open business meeting on July 27, 1988, by unanimous vote of a quorum present, recommends that the Senate pass H.R. 3977, as amended.

The rollcall vote on reporting the matter to the Senate was 19 yeas and 0 nays as follows:

YEAS	NAYS
Mr. Johnston	
Mr. Bumpers	
Mr. Ford	
Mr. Metzenbaum*	
Mr. Melcher	
Mr. Bradley	
Mr. Bingaman*	
Mr. Wirth	
Mr. Fowler	
Mr. Conrad*	
Mr. McClure	
Mr. Hatfield*	
Mr. Weicker*	
Mr. Domenici*	
Mr. Wallop	
Mr. Murkowski	
Mr. Nickles	
Mr. Hecht*	
Mr. Evans	

*Indicates voted by proxy.

Committee Amendments

The Committee amendment consists of the text of S. 2240, as amended by the Committee, as a substitute for the text of H.R. 3977.

Section-by-Section Analysis

Section 1 states the title of the measure.

Subsection 2(a) amends section 1(a)(1) of Public Law 97-409 by authorizing the appropriation of $400,000 for each participating state mineral institute for each fiscal year 1990 through 1994.

Subsection 2(b) amends section 1(a)(2)(A) of Public Law 98-409 to provide that funds appropriated under this section shall be made available for grants to be matched on a basis of no less than two non-Federal dollars for each Federal dollar.

Subsection 2(c) is self-explanatory.

Section 3 amends subsection 2(a) of Public Law 98-409 to authorize to be appropriated $15 million for fiscal years 1990 through 1994, which shall remain available until expended.

Section 4 is self-explanatory.

Subsection 5(a) amends section 9(a)(7) of Public Law 98-409 to provide for the appointment of an additional representative from the mining industry to the Committee on Mining and Mineral Resources Research.

Subsection 5(b) amends the second sentence of section 9(e) of Public Law 98-409 to require the Committee on Mining and Mineral Resources Research to submit an update of a national plan for research by January 15 of each calendar year.

Section 6 amends section 10(b) of Public Law 98–409 to provide that, notwithstanding the provisions of subsection (a), those colleges or universities which, on the date of enactment, have a mining or mineral resources research institute program which has been found to be eligible pursuant to Public Law 98–409 shall continue to be eligible pursuant to this Act subject to review a least once during the period authorized by this Act.

Section 7 requires the Committee on Mining and Mineral Resources Research to submit a proposal to establish a Generic Mineral Technology Center on Strategic and Critical Minerals to the Congress by January 15, 1990. It is the view of the Committee that the Committee on Mining and Mineral Resources Research should recommend to the Congress a mechanism by which new generic mineral technology centers can be established and existing centers can be phased-out or consolidated upon the completion of their mission.

Cost and Budgetary Considerations

The following estimate of costs of this measure has been provided by the Congressional Budget Office.

CONGRESSIONAL BUDGET OFFICE
U.S. CONGRESS
WASHINGTON, DC 20515

July 29, 1988

Honorable J. Bennett Johnston, Jr.
Chairman
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

The Congressional Budget Office has prepared the attached cost estimate for S. 2240, a bill to amend the Act to reauthorize the State Mining and Mineral Resources Research Institute Program, and for other purposes.

If you wish further details on this estimate, we will be pleased to provide them.

Sincerely,

James L. Blum
Acting Director

cc: Honorable James A. McClure
Ranking Minority Member

CONGRESSIONAL BUDGET OFFICE

COST ESTIMATE

July 29, 1988

1. BILL NUMBER: S. 2240

2. BILL TITLE:

A bill to amend the Act to reauthorize the State Mining and Mineral Resources Research Institute Program, and for other purposes.

3. BILL STATUS:

As ordered reported by the Senate Committee on Energy and Natural Resources, July 27, 1988.

4. BILL PURPOSE:

S. 2240 would authorize the appropriation of $15 million annually for mining and minerals research grants administered by the Bureau of Mines and $400,000 annually per grant for allotment grants to states from fiscal year 1990 to fiscal year 1994.

5. ESTIMATED COST TO THE FEDERAL GOVERNMENT:

(by fiscal year, in millions of dollars)

	1989	1990	1991	1992	1993
Authorizaticn Level					
Specific	---	15.0	15.0	15.0	15.0
Estimated	---	12.8	12.8	12.8	12.8
Total Authorization Level	---	27.8	27.8	27.8	27.8
Estimated Outlays	---	18.9	25.9	27.2	27.8

The costs of this bill fall within budget function 300.

Basis of Estimate:

This estimate assumes that the full amounts authorized would be appropriated for each fiscal year. The authorized funding for allotment grants to participating states is shown in the estimated authorization level. The estimate is based on an assumption that the number of grants awarded would continue at the current level of 32 per year, and they would be funded at the full $400,000 authorized per grant. The estimated outlays are based on historical spending patterns.

6. ESTIMATED COST TO STATE AND LOCAL GOVERNMENTS:

   The allotment grants awarded through this program are matching grants, requiring that two nonfederal dollars be provided for each federal dollar. Many of the recipients of these grants are state universities.

7. ESTIMATE COMPARISON: None.

8. PREVIOUS CBO ESTIMATE:

   On May 20, 1988, CBO prepared an estimate for H.R. 3977, a bill to authorize appropriations for the Mining and Mineral Resources Institute Act for fiscal years 1990 through 1993, as ordered reported by the House Committee on Interior and Insular Affairs, April 20, 1988. H.R. 3977 would authorize $14.4 million a year for mining and minerals research grants, rather than the $15 million authorized in this bill. The estimates reflect that difference.

9. ESTIMATE PREPARED BY: Michael Sieverts (226-2860)

10. ESTIMATE APPROVED BY:

James L. Blum
Assistant Director
for Budget Analysis

Regulatory Impact Evaluation

In compliance with paragraph 11(b) of Rule XXVI of the Standing Rules of the Senate, the Committee makes the following evaluation of the regulatory impact which would be incurred in implementing H.R. 3977, as amended. The measure is not a regulatory measure in the sense of imposing Government-established standards or significant economic responsibilities on private individuals and business.

No personal information would be collected in administering the program. Therefore, there would be no impact on personal privacy.

Little, if any, additional paperwork would result from the enactment of H.R. 3977.

Executive Communications

The Committee did not request Executive agency views on S. 2240. Following is the Department of the Interior's statement at the June 27, 1988, hearing.

Statement of Dr. John D. Morgan
Chief Staff Officer, Bureau of Mines
Department of the Interior
before the
Subcommittee on Mineral Resources Production and Development
Committee on Energy and Natural Resources
United States Senate
June 27, 1988

Mr. Chairman and Members of the Committee, we appreciate the opportunity to appear before you to present the Department of the Interior's views on S. 2240, a bill to extend the State Mining and Mineral Resources Research Institute program. I am accompanied by Dr. Ronald A. Munson, Chief, Office of Mineral Institutes of the Bureau of Mines. My involvement with this program goes back more than 20 years, because I served from 1965 to 1969 as a member of the Committee on Mineral Science and Technology of the National Academy of Sciences which recommended increased Government/industry/university cooperation in mineral-related research and I have represented the Bureau of Mines on the Advisory Committee since the Mineral Institute program was established by law in 1977. Dr. Munson, with long experience as a Bureau of Mines scientist, has been Chief of the Office of Mineral Institutes since 1982, when the program was transferred by the Secretary of the Interior to the Bureau of Mines.

The Mineral Institute Program was initiated to provide seed money to encourage the development of mineral-related Government/industry/university research and graduate education programs at selected State colleges and universities. The States have responded and the programs are in place. The majority of the support at these schools comes from non-Federal sources. Accordingly, this program is no longer an appropriate use of Federal funds, as State and private resources are adequate to continue the program at an appropriate level.

In view of the continuing Federal budgetary deficits, the Administration cannot support S. 2240 as presently drafted. However, we would not oppose specific reauthorization of the centers of generic mineral technology and a continuation of the Advisory Committee. The current generic mineral technology areas provide broad-based research facilities and personnel that complement and supplement basic research critical to the Nation's economy and security. The legally authorized Advisory Committee now provides a useful focal point for review and recommendations on mining and mineral resources research, and, in the event of a national emergency, it could aid in mobilizing scientific resources in this important area. The allotment grant program is now sufficiently mature as to be sustained by the States and the private sector.

However, as we indicated in the President's Budget, the Administration does not believe that Federal funding is needed to continue this program. Our not objecting to a narrow programmatic reauthorization should not be construed as a commitment to necessarily request future funding.

Ever since its establishment in 1910, the Bureau of Mines has been fully cognizant of the need for Government/industry/university involvement in research to improve health and safety and efficiency in the mineral industries. The Bureau's first research station was established in Pittsburgh, Pennsylvania, next door to Carnegie Tech University, a prominent center of excellence in mining engineering and metallurgy. I might add that we are working with Carnegie Mellon University presently on robotic devices that offer promise of moving miners back from the dangers of the mine face. In 1910, Pittsburgh was a major center of the U.S. steel, coal, oil, gas, aluminum, and other mineral industries, facilitating Government/industry/university cooperation.

In its many years of existence the Bureau has actively maintained a synergistic relationship among Government/industry/university researchers to foster and encourage innovation and technology transfer. The proximity of Bureau research centers to major universities permits university professors and graduate students to utilize specialized Bureau facilities, while also allowing Bureau scientists to serve as adjunct professors in their areas of specialization. Technology transfer occurs not only through directed Bureau activities but also through numerous meetings at local, State, and national levels of the many professional societies concerned with various sectors of the mineral industry. We encourage our Bureau researchers to participate in these fruitful exchanges.

Sections 3 and 5 of the Organic Act of the Bureau of Mines (Exhibit "A") provide broad authority for the Bureau to do whatever is necessary with regard to research, either in-house or in cooperation with others. Our 13 field locations listed in Exhibit "A" provide convenient access by the mineral industry. Moreover, each of our research centers is located either on the campus of a well-known mineral-oriented university or in close proximity thereto.

To more sharply focus some of the research, in 1982 the Advisory Committee took the lead in establishing Centers of Generic Mineral Technology, each to cover a major research area of the mineral industry that would be applicable to many diverse interests. As illustrated in Exhibit "B," established Centers already functioning include: Mine Systems Design and Ground Control, Comminution (a technical term for crushing and grinding), Pyrometallurgy, Mineral Industry Waste Treatment and Recovery, and Respirable Dust. Projects underway at these five Generic Centers are listed in the December 15, 1987 "Report on the Mineral Institute Program," (part of Exhibit "C").

The 1984 Act which reauthorized the Mineral Institute program (PL 98-409) directed the Committee on Mining and Mineral Resources Research to develop a national plan for research in mining and mineral resources. This plan, entitled "Improving Research and Education in Mineral Science and Technology Through Government - (Federal, State, and Local), Industry and University Cooperation" was submitted to the President and the Congress in 1986. The Act also mandates an annual updating of the plan. The second update prepared by the Advisory Committee was dated December 15, 1987, and was submitted to

the President and the Congress by Secretary Hodel on March 4, 1988 (Exhibit "C"). In essence, the original plan and the subsequent updates endorse ongoing research by regular Government agencies, particularly the National Science Foundation and the Departments of the Interior, Energy, Defense, and Commerce, and the plan noted that university participation should be on a competitive basis to ensure diversity, quality, and productivity, with Generic Mineral Technology Centers having highest priority.

Since its inception in 1977 through fiscal year 1988, over $97 million has been made available to the program. Some $85 million has been obligated for the Mineral Institute program as detailed in Exhibit "D". Approximately another $12.5 million is available in this year, fiscal year 1988, and we are now establishing two additional Generic Centers: a Marine Minerals Technology Center, based on the University of Mississippi and the University of Hawaii at Manoa, and a National Mine Land Reclamation Center, based on the University of West Virginia. These latter two Generic Centers were mandated by the Congress in the legislation providing for Bureau operations in fiscal year 1988. To implement the "Center for Cataloging" concept, each of the Generic Centers maintains a "Reference Center" with in-depth coverage of relevant scientific and technical publications, as well as information on research projects underway.

Mr. Chairman, that concludes my prepared statement and we shall be pleased to reply to any questions.

Title 30, USCA

§ 3. Same; duties of Bureau of Mines

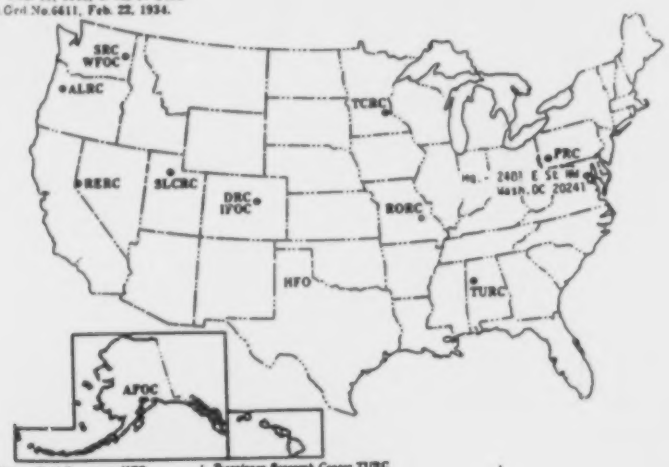
It shall be the province and duty of the Bureau of Mines, subject to the approval of the Secretary of the Interior, to conduct inquiries and scientific and technologic investigations concerning mining, and the preparation, treatment, and utilization of mineral substances with a view to improving health conditions, and increasing safety, efficiency, economic development, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries; to inquire into the economic conditions affecting these industries; to investigate explosives and peat; and on behalf of the Government to investigate the mineral fuels and unfinished mineral products belonging to, or for the use of, the United States, with a view to their most efficient mining, preparation, treatment, and use; and to disseminate information concerning these subjects in such manner as will best carry out the purposes of the provisions of sections 1, 3, and 5 to 7 of this title.

May 16, 1910, c. 240, § 2, 36 Stat. 370; Feb. 25, 1913, c. 72, 37 Stat. 681; Ex.Ord.No.4239, June 4, 1925; Ex.Ord.No.6611, Feb. 22, 1934.

§ 5. Reports of investigations

The Director of the Bureau of Mines shall prepare and publish, subject to the direction of the Secretary of the Interior, under the appropriations made from time to time by Congress, reports of inquiries and investigations, with appropriate recommendations of the bureau, concerning the nature, causes, and prevention of accidents, and the improvement of conditions, methods, and equipment, with special reference to health, safety, and prevention of waste in the mining, quarrying, metallurgical, and other mineral industries; the use of explosives and electricity, safety methods and appliances, and rescue and first-aid work in said industries; the causes and prevention of mine fires; and other subjects included under the provisions of sections 1, 3, and 5 to 7 of this title.

May 16, 1910, c. 240, § 3, 36 Stat. 370; Feb. 25, 1913, c. 72, 37 Stat. 681; Ex.Ord.No.4239, June 4, 1925; Ex.Ord.No.6611, Feb. 22, 1934.



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Research Director: Laura V. Wade

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Chief: Richard B. Grabowski

Exhibit "A"

THE RELATIONSHIP OF THE GENERIC MINERAL TECHNOLOGY CENTERS

TO STEPS IN THE PROCESSING OF MINERAL MATERIALS

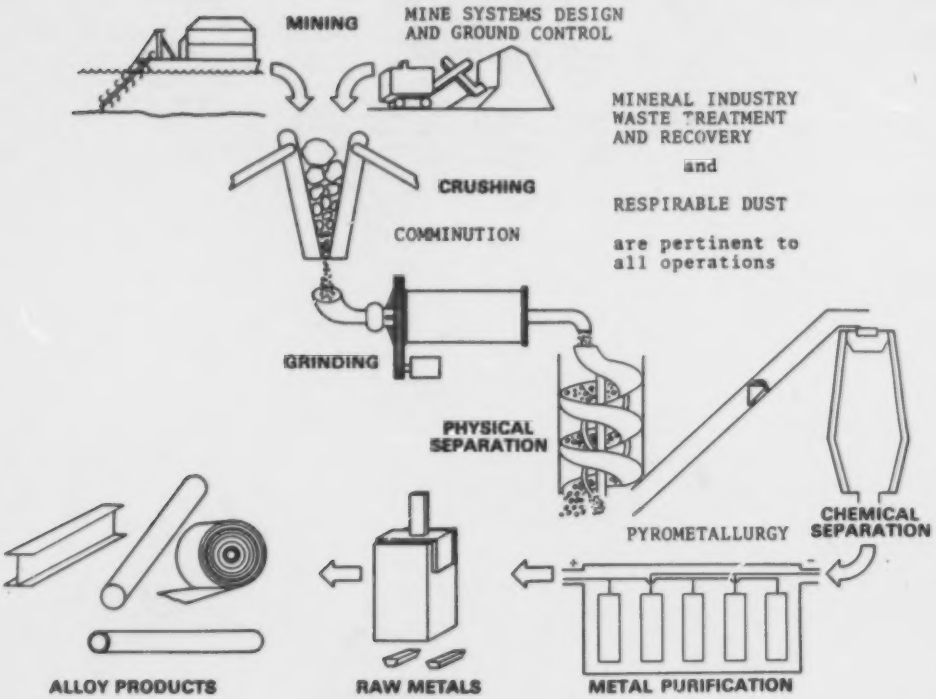

Exhibit "B"

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

March 4, 1988

The President
The White House
Washington, D.C. 20500

Dear Mr. President:

Enclosed please find the "1988 Update to the National Plan for Research in Mining and Minerals Resources" and "The 1987 Report on the Mineral Institute Program of the U.S. Department of the Interior" pursuant to Secs. 4. (c) and 9. (e), Public Law 98-409, State Mining and Mineral Resources Research Institute Program Act of 1984.

Sincerely,

/s/

DONALD PAUL HODEL

Enclosures

Identical letters to:
Honorable George Bush, President of the Senate
Honorable Jim C. Wright, Jr., Speaker of the House of Representatives

Exhibit "C"

December 15, 1987

1988 UPDATE TO THE NATIONAL PLAN FOR RESEARCH IN MINING AND MINERAL RESOURCES

Report to:

The Secretary of the Interior
The President of the United States
The President of the Senate
The Speaker of the House of Representatives

Section 9(a) of Public Law 98-409 of August 29, 1984, (98 Stat. 1536 et seq.) mandates that the Committee on Mining and Mineral Resources Research submit an annual update to the National Plan for Research in Mining and Mineral Resources: "Improving Research and Education in Mineral Science and Technology through Government-(Federal, State and Local), Industry, and University Cooperation."

The rocks, soils, and fluids of the earth are the source of the minerals required for national security and economic development. Coal, petroleum, natural gas, and uranium supply almost all of our energy, and petrochemicals are the feedstocks for plastics. Nitrogen, phosphorus, potassium, and sulfur are major fertilizer components, which, with more than two dozen trace elements, make possible our abundant agriculture. Stone, sand, gravel, and cement are widely used construction materials. Iron, copper, lead, zinc, nickel, and chromium have extensive uses in machinery and consumer products. And now rare elements, such as gallium, germanium, indium, neodymium, rhenium, scandium, and yttrium, make possible numerous high-technology applications.

Searching for mineral resources and improving use antedate the foundation of the nation. Since then, federal and state legislation, too varied and numerous to document, has been enacted to encourage resource development. Recent major items of legislation specifically referring to minerals include: the Defense Production Act, the Stock Piling Act, the Mining and Minerals Policy Act, the National Materials and Minerals Policy, Research and Development Act, the National Critical Materials Act, and our Act cited in paragraph 1 above.

The present period is characterized by increasing world competitiveness, a broad spectrum of threats to the independence of free peoples, heightened environmental concerns, and increasing indebtedness. Consequently, recognizing the need to make maximum effective use of the nation's scientific and engineering resources, the President, on April 10, 1987, issued Executive Order 12591 (Appendix "A") entitled "Facilitating Access to Science and Technology." Section 6 of EO 12591 clearly endorses the recommendation of our first two reports that

GOVERNMENT/INDUSTRY/UNIVERSITY COOPERATION IN RESEARCH IS THE MOST EFFECTIVE WAY TO MARSHAL OUR CRITICAL SKILLS AND SPECIALIZED FACILITIES.

In the early years of this decade, this Committee took the lead in 2/3
establishing five "Generic Mineral Technology Centers," each intended to bring together government, industry, and universities across state lines to form "Centers" with critical masses for effective research applicable to some major elements of the mineral sector of the economy. These Centers are:

Mine Systems Design and Ground Control (centered at Virginia Polytechnic Institute and State U., with affiliates at U. of Alabama, U. of Alaska-Fairbanks, Colorado School of Mines, U. of Idaho, Southern Illinois U., U. of Kentucky, and U. of Nevada-Reno): brings together experts familiar with conditions ranging from the permafrost of the Arctic to the Tropics, and also with fuels, nonmetallics, metals, brines, and open-pit and underground mines.

Comminution (centered at U. of Utah, with affiliates at U. of Minnesota, U. of California-Berkeley, Colorado School of Mines, Michigan Technological U., New Mexico Institute of Mining and Technology, Pennsylvania State U., and Virginia Polytechnic Institute and State U.): devoted to crushing and grinding because, with the exception of sand, gravel, and ornamental cut stone, almost all minerals after mining are reduced in size to facilitate removal of unwanted constituents and to improve recovery of desired elements or compounds. Moreover, comminution is an energy-intensive process and improvements should also improve the efficiency of energy utilization.

Pyrometallurgy (centered at U. of Missouri-Rolla, with affiliates at Purdue U., Ohio State U., Massachusetts Institute of Technology, and U. of Utah): applications of high temperatures to mineral processes such as smelting, refining, and alloying in major industries including steel, copper, lead, zinc, nickel, ferroalloys, and refractory metals.

Mineral Industry Waste Treatment and Recovery (centered at U. of Nevada-Reno, with affiliates at U. of Idaho., Montana College of Mineral Science and Technology, New Mexico Institute of Mining and Technology, Pennsylvania State U., and South Dakota School of Mines and Technology): focussing on controlling the fumes, dusts, and liquid and solid wastes generated throughout the mineral sector of the economy, many of which, if properly treated, are sources of valuable materials.

Respirable Dust (centered at Pennsylvania State U. and West Virginia U., with affiliates at U. of Minnesota and Massachusetts Institute of Technology): brings together experts concerned with particles causing potentially disabling or fatal diseases, including pneumoconiosis ("black-lung"), silicosis, and asbestosis, the latter of deep concern not just to workers in the mineral sector of the economy but also to the general populace.

The "1987 Report on the Mineral Institute Program of the U.S. Department of the Interior" (Appendix "B") includes a list of the research projects currently under way at the five Generic Mineral Technology Centers.

The National Science Foundation (NSF) establishes "Engineering Centers" in other areas, some of which, such as those involving Advanced Combustion, Composites, Net Shape Manufacturing, and Hazardous Substance Control, relate to the mineral sector of the economy. Moreover, NSF's active support of basic research in the physical and life sciences and engineering contributes importantly to the fundamental scientific base which is drawn upon by the more applied disciplines in our area such as geology, geophysics, geochemistry, geobotany, mining engineering, geological engineering, petroleum and natural gas engineering, metallurgy, and ceramics. The Department of Energy supports a broad spectrum of research involving mineral fuels and fuel technology. The Committee also notes the importance of the continued research efforts of the U.S. Geological Survey, which for more than a century has enjoyed a worldwide reputation, and of the Bureau of Mines, which similarly has been in the forefront of world mineral research for eight decades. Researchers at the Mineral Institutes are cognizant of related work and the program is managed to avoid undesired duplication.

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A specific responsibility of the Committee, set forth in Section 10 of the Act, is to determine the eligibility of institutions participating as mining and mineral resources research institutes. During 1987 the Committee conducted a detailed review of the 32 Mineral Institutes, utilizing the criteria specified in the Act. The Committee is now evaluating the eligibility of those institutions on the basis of that review. Whether additional Generic Mineral Technology Centers may be needed is also a question that needs to be considered, especially in the light of the fact that, in considering Fiscal Year 1988 budgets, the Congress has moved to create additional mineral-related centers. Consequently, to avoid wasteful duplication of effort, to assure appropriate integration with existing programs, and to provide necessary oversight, legislation establishing such new mineral-related centers should provide that they come under the purview and jurisdiction of Public Law 98-409, thus assuring consistency with the national plan for research in mining and mineral resources.

In the past decade the Mineral Institute program has made major improvements in university research in mineral science and technology, and the Committee feels that continued encouragement by industry and government is in the national interest.

SIGNED:

Carl E. Randolph
Mining Industry

Win Aung
National Science Foundation

Don L. Warner
University Administrator

Walter R. Hibbard, Jr.
National Academy of Sciences

John H. DeYoung, Jr.
U.S. Geological Survey

Joseph N. Crowley
University Administrator

John C. Calhoun, Jr.
National Academy of Engineering

John D. Morgan
Bureau of Mines

Edward S. Fromling
Mining Industry

Orme Lewis, Jr.
Conservation Community
COCHAIR

James W. Ziglar
Asst. Secretary-
Water & Science
U.S. Department of the Interior
COCHAIR

(Brief biographies are in Appendix "C")

Appendix "A"

Executive Order 12591 of April 10, 1987

Facilitating Access to Science and Technology

By the authority vested in me as President by the Constitution and laws of the United States of America, including the Federal Technology Transfer Act of 1986 (Public Law 99-502), the Trademark Clarification Act of 1984 (Public Law 98-620), and the University and Small Business Patent Procedure Act of 1980 (Public Law 96-517), and in order to ensure that Federal agencies and laboratories assist universities and the private sector in broadening our technology base by moving new knowledge from the research laboratory into the development of new products and processes, it is hereby ordered as follows:

Section 1. *Transfer of Federally Funded Technology.*

(a) The head of each Executive department and agency, to the extent permitted by law, shall encourage and facilitate collaboration among Federal laboratories, State and local governments, universities, and the private sector, particularly small business, in order to assist in the transfer of technology to the marketplace.

(b) The head of each Executive department and agency shall, within overall funding allocations and to the extent permitted by law:

(1) delegate authority to its government-owned, government-operated Federal laboratories:

(A) to enter into cooperative research and development agreements with other Federal laboratories, State and local governments, universities, and the private sector; and

(B) to license, assign, or waive rights to intellectual property developed by the laboratory either under such cooperative research or development agreements and from within individual laboratories.

(2) identify and encourage persons to act as conduits between and among Federal laboratories, universities, and the private sector for the transfer of technology developed from federally funded research and development efforts;

(3) ensure that State and local governments, universities, and the private sector are provided with information on the technology, expertise, and facilities available in Federal laboratories;

(4) promote the commercialization, in accord with my Memorandum to the Heads of Executive Departments and Agencies of February 18, 1983, of patentable results of federally funded research by granting to all contractors, regardless of size, the title to patents made in whole or in part with Federal funds, in exchange for royalty-free use by or on behalf of the government;

(5) implement, as expeditiously as practicable, royalty-sharing programs with inventors who were employees of the agency at the time their inventions were made, and cash award programs; and

(6) cooperate, under policy guidance provided by the Office of Federal Procurement Policy, with the heads of other affected departments and agencies in the development of a uniform policy permitting Federal contractors to retain the rights to software, engineering drawings, and other technical data generated by Federal grants and contracts, in exchange for royalty-free use by or on behalf of the government.

Sec. 2. *Establishment of the Technology Share Program.* The Secretaries of Agriculture, Commerce, Energy, and Health and Human Services and the Administrator of the National Aeronautics and Space Administration shall select one or more of their Federal laboratories to participate in the Technology Share Program. Consistent with its mission and policies and within its overall funding allocation in any year, each Federal laboratory so selected shall:

(a) identify areas of research and technology of potential importance to long-term national economic competitiveness and in which the laboratory possesses special competence and/or unique facilities;

(b) Establish a mechanism through which the laboratory performs research in areas identified in Section 2(a) as a participant of a consortium composed of United States industries and universities. All consortia so established shall have, at a minimum, three individual companies that conduct the majority of their business in the United States; and

(c) Limit its participation in any consortium so established to the use of laboratory personnel and facilities. However, each laboratory may also provide financial support generally not to exceed 25 percent of the total budget for the activities of the consortium. Such financial support by any laboratory in all such consortia shall be limited to a maximum of $5 million per annum.

Sec. 3. *Technology Exchange—Scientists and Engineers.* The Executive Director of the President's Commission on Executive Exchange shall assist Federal agencies, where appropriate, by developing and implementing an exchange program whereby scientists and engineers in the private sector may take temporary assignments in Federal laboratories, and scientists and engineers in Federal laboratories may take temporary assignments in the private sector.

Sec. 4. *International Science and Technology.* In order to ensure that the United States benefits from and fully exploits scientific research and technology developed abroad,

(a) The head of each Executive department and agency, when negotiating or entering into cooperative research and development agreements and licensing arrangements with foreign persons or industrial organizations (where these entities are directly or indirectly controlled by a foreign company or government), shall, in consultation with the United States Trade Representative, give appropriate consideration:

(1) to whether such foreign companies or governments permit and encourage United States agencies, organizations, or persons to enter into cooperative research and development agreements and licensing arrangements on a comparable basis;

(2) to whether those foreign governments have policies to protect the United States intellectual property rights; and

(3) where cooperative research will involve data, technologies, or products subject to national security export controls under the laws of the United States, to whether those foreign governments have adopted adequate measures to prevent the transfer of strategic technology to destinations prohibited under such national security export controls, either through participation in the Coordinating Committee for Multilateral Export Controls (COCOM) or through other international agreements to which the United States and such foreign governments are signatories.

(b) The Secretary of State shall develop a recruitment policy that encourages scientists and engineers from other Federal agencies, academic institutions, and industry to apply for assignments in embassies of the United States; and

(c) The Secretaries of State and Commerce and the Director of the National Science Foundation shall develop a central mechanism for the prompt and efficient dissemination of science and technology information developed abroad to users in Federal laboratories, academic institutions, and the private sector on a fee-for-service basis.

Sec. 5. *Technology Transfer from the Department of Defense.* Within 6 months of the date of this Order, the Secretary of Defense shall identify a list of funded technologies that would be potentially useful to United States industries and universities. The Secretary shall then accelerate efforts to make these technologies more readily available to United States industries and universities.

Sec. 6. *Basic Science and Technology Centers.* The head of each Executive department and agency shall examine the potential for including the establishment of university research centers in engineering, science, or technology in the strategy and planning for any future research and development programs. Such university centers shall be jointly funded by the Federal Government, the private sector, and, where appropriate, the States and shall focus on areas of fundamental research and technology that are both scientifically promising and have the potential to contribute to the Nation's long-term economic competitiveness.

Sec. 7. *Reporting Requirements.* (a) Within 1 year from the date of this Order, the Director of the Office of Science and Technology Policy shall convene an interagency task force comprised of the heads of representative agencies and the directors of representative Federal laboratories, or their designees, in order to identify and disseminate creative approaches to technology transfer from Federal laboratories. The task force will report to the President on the progress of and problems with technology transfer from Federal laboratories.

(b) Specifically, the report shall include:

(1) a listing of current technology transfer programs and an assessment of the effectiveness of these programs;

(2) identification of new or creative approaches to technology transfer that might serve as model programs for Federal laboratories;

(3) criteria to assess the effectiveness and impact on the Nation's economy of planned or future technology transfer efforts; and

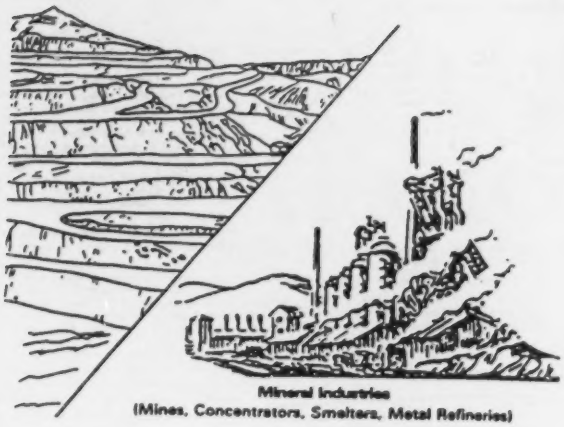
(4) a compilation and assessment of the Technology Share Program established in Section 2 and, where appropriate, related cooperative research and development venture programs.

Sec. 8. *Relation to Existing Law.* Nothing in this Order shall affect the continued applicability of any existing laws or regulations relating to the transfer of United States technology to other nations. The head of any Executive department or agency may exclude from consideration, under this Order, any technology that would be, if transferred, detrimental to the interests of national security.

Ronald Reagan

THE WHITE HOUSE,
April 10, 1987.

Appendix "B"



The 1987 Report on the Mineral Institute Program of the U.S. Department of the Interior

Government/Industry/University Research Cooperation Pursuant to PL 98-409

December 15, 1987

Mineral Institute Program 1987 Annual Report

ACTIVITY OVERVIEW

In order to encourage State support for basic research in the mineral sciences and engineering, allotment grants, which must be matched, are made to designated State Mineral Institutes (no more than one per State) at research-oriented schools of higher learning. The Mineral Institute program is authorized under Public Law 98-409 through fiscal year 1989. This Act requires allotment grant matching on the basis of 2 State dollars for each Federal dollar in fiscal years 1987, 1988, and 1989. The designation of a State institution of higher learning as a Mineral Institute creates an administrative mechanism for channeling funds to academic departments in response to their contribution to mineral engineering research. In addition to allotment grants, research grants are made in five generic mineral technology areas to the designated Institutes in support of research of broad applicability to the minerals industry. Concentration of research funds to develop focal points for research in particular mineral-related areas was done in response to a 1982 congressional directive to consolidate the Mineral Institute program. The 32 institutions eligible to participate in the program in 1988 are:

1. University of Alabama
2. University of Alaska - Fairbanks
3. University of Arizona
4. University of California - Berkeley
5. Colorado School of Mines
6. Georgia Institute of Technology
7. University of Idaho
8. Southern Illinois University
9. Purdue University (Indiana)
10. Iowa State University
11. University of Kentucky
12. Louisiana State University
13. Massachusetts Institute of Technology
14. Michigan Technological University
15. University of Minnesota
16. University of Mississippi
17. University of Missouri - Rolla
18. Montana College of Mineral Science and Technology
19. University of Nevada - Reno
20. New Mexico Institute of Mining and Technology
21. Columbia University (New York)
22. University of North Dakota
23. Ohio State University
24. University of Oklahoma

25. Pennsylvania State University
26. South Dakota School of Mines and Technology
27. University of Texas
28. University of Utah
29. Virginia Polytechnic Institute and State University
30. University of Washington
31. West Virginia University
32. University of Wyoming.

ALLOTMENT GRANT PROGRAM

Effective each July 1, new allotment grants are made to each of the Mineral Institutes. These awards of $138,000 for support during the 1987-88 school year, were made on the basis of proposals received from each Institute and approved by the Bureau of Mines. No allotment was withheld.

In 1987, allotment funds were used for student support as 132 undergraduate and 314 graduate students were aided in obtaining degrees in mineral-related fields. A major portion of the Mineral Institute allotment funds was used to support 238 research miniprojects. Although no mineral conferences were sponsored this year, 24 continuing education courses were offered. Three special mineral courses and a student field trip also received aid. Equipment purchases were more widespread. Twenty-two major scientific instruments were purchased for 12 laboratories and 6 institutions added to their stock of computers and peripherals. At three institutions, funds were used on maintenance contracts for major equipment. In addition, three institutions used funds to support technicians and one visiting professor and 10 post-doctoral students were supported. Books were purchased for the libraries at 8 schools. Two institutions used funds to aid in the preparation and distribution of newsletters and one institution continued to support the preparation of a State Mineral Producers List and Handbook.

While the Mineral Institute program does not support construction of facilities, its presence encourages States to erect appropriate facilities. At the University of Missouri-Rolla, the $14 million V. H. McNutt Mineral Engineering building, housing six academic departments of the Missouri School of Mines, was completed this year. A new 118,000 square foot Minerals and Materials Building is under construction at Michigan Technological University. The building which will cost $27 million, will house mining engineering, metallurgical engineering, and the Institute for Materials Processing. The State of Michigan will provide an additional $10 million to equip the building now scheduled for completion in October 1989. At Purdue University, 49,000 square feet of a new wing of the Civil Engineering Building, now under construction, will be occupied next year by the Department of Geosciences and an additional 16,000 square feet by Geotechnical Engineering. Also at Purdue, materials engineering will move into part of a new engineering building in the spring of 1988. This year, Montana College of Mineral Science and Technology completed a new 50,000 square foot building at a cost of $5.7 million for the Departments of

3

Metallurgy, Mineral Processing, and Geophysical Engineering. The former Bureau of Mines facilities on the University of Utah campus that have been renovated and earthquake proofed, are now being used by the School of Engineering and the College of Mines. Immediately adjacent 50 percent of a new 50,000 square foot Energy and Minerals Research Laboratory built at a cost of $4.3 million is being used by the College of Mines. And adjacent to that building, a largely underground Energy and Minerals Classroom building having 60,000 square feet and costing $5.8 million was completed this year. A new 150,000 square foot Mineral Research building estimated to cost $18.5 million is being built on the campus of the University of Alabama for use in April 1989. To be added later at Alabama is a 55,000 square foot engineering and science library on campus and a pilot plant off campus for an additional $20 million. A new $7.8 million building at the University of Kentucky will soon be occupied by Mining Engineering, the Kentucky Geological Survey, coal geology research, and the Mineral Institute. Construction is carried out using funds from sources other than the Mineral Institute appropriations.

GENERIC CENTER RESEARCH PROGRAM

Research grants are concentrated in five generic mineral technology areas of broad applicability across the minerals industry. Each generic area has at least one lead institution which coordinates research activities in that area, provides for Annual Seminars, and operates Reference Centers which disseminate research results relating to its particular area of research expertise. In 1987, additional grants totaling $5,398,610 were made in the five generic mineral technology areas.

Generic Area	Lead Institutions	Affiliates
Mine Systems Design and Ground Control	Virginia Polytechnic Institute and State University	University of Alabama University of Alaska-Fairbanks University of Arizona Colorado School of Mines University of Idaho Southern Illinois University University of Kentucky University of Nevada - Reno University of Utah
Comminution	University of Utah	University of Minnesota University of California - Berkeley Colorado School of Mines Michigan Technological University Pennsylvania State University Virginia Polytechnic Institute and State University

Generic Area	Lead Institutions	Affiliates
Mineral Industry Waste Treatment and Recovery	University of Nevada - Reno	University of Arizona Colorado School of Mines University of Minnesota Montana College of Mineral Science and Technology New Mexico Institute of Mining and Technology University of Oklahoma Pennsylvania State University South Dakota School of Mines and Technology.
Pyrometallurgy	University of Missouri-Rolla	Purdue University Ohio State University Massachusetts Inst. of Technology University of Utah University of Kentucky.
Respirable Dust	Pennsylvania State University West Virginia University	University of Minnesota Massachusetts Inst. of Technology Michigan Technological University.

Research Projects Underway in FY 1988

Mine Systems Design and Ground Control

Longwall Interaction in Multi-Seam Mining
Upper Seam Stabilization in Multi-Seam Mining
Underground Characterization of Strata Using Advanced Statistical Methods
Improved Airflow and Climate of Underground Mines
Mine Management Decision Support
Post-Failure Behavior of Coal Pillars
Diesel and Electric-Cable-Reel Shuttle-Car Comparison
Alabama Coal Field Subsidence
Access Design in Permafrost
Failure in Coal-Bearing Roofs
Reinforced Timber Posts
Underground Booster Fans
Holographic Testing of Materials for Surface Mining
Design Problems of a Surface Coal Mine in North Slope of Alaska
Thick Seam Coal Mining Systems Design
Soft Floor Interaction on Room and Pillar Coal Mining

Mine Systems Design and Ground Control (continued) 5

Knowledge Systems for Electrical Maintenance of Underground Mining Machines
Immediate Floor Strata Deformability
Rock Mass Stiffness Using Surface Wave Geophysics
Analysis of Longwall Failures
Control Measures for Surface Structure Above Undermined Areas
Cable Bolting in Vertical Crater Retreat Stopes
Thick Seam Coal Mine Design

Comminution

Computer Simulation of Complex Circuits
Large Grinding Mill Dynamics
Phenomenological Model of Hydrocyclones and Wet Screening
Tracer Study of Rod Mill Transport
Application of Modern Control Theory to Crushing
Fluid-Flow and Particle Trajectories in Hydrocyclone Using Motion Analyzer
Numerical Simulation of Comminution in Jointed Geological Media
Semi-Autogenous Grinding
Evaluation of Two-Stage Classification
Density Interaction in Hydrocyclones
New Technology Evaluation
Liberation Analysis of Multicomponent Systems
Effect of Microfractures on Rock Fragmentation by Explosives
Tumbling Mill Efficiency
Improved Grinding Circuit Performance and Slurry Rheology
Mechanism of Corrosive Wear of Grinding Media
Roll Mills for Fine Comminution
Automatic Control of Two-Stage Classification
Volumetric Composition of Locked Particles by Energy Dispersive Analysis
Breakage Characteristics of Particle Mixtures

Mineral Industry Waste Treatment and Recovery

Precipitation Mechanisms of Heavy Metals
Dissolution of Lead From Smelter Dusts
Recovery of Copper and Arsenic From Electrorefining Wastes
Tailing Fluids Waste treatment
Phosphorus Removal From Steelmaking Slags
Controlling Acid Mine Drainage at the Bunker Hill Mine
Supercritical Extraction of Platinum-Group Metals
Cyanide in Mill Tailings Impoundments
Acid-Producing Hot Spots Within Reclaimed Surface Mine Spoil
Spatial Variability of Mill Tailings Hydraulic Properties
Fluoride Wastes From Mineral Processing Plants
Flotation of Fines
Clean-up of Mine Waters Using Electrodialysis
Stainless Steel Spent Pickling Solutions
Stable and Filterable Precipitates for Removal of Toxic Waste Species

Mineral Industry Waste Treatment and Recovery (continued)

- Suspended Solids Recovery Using Fluidized and Packed Beds
- Hazardous Effluent Movement in the Subsurface Using Complex Geotomography (radar image reconstruction)
- Enhanced Volatilization of Arsenic and Antimony From Flue Dusts and Speiss
- Plasma Process to Treat Electric Furnace Dust
- Hydrometallurgical Treatment of Zinc-Bearing Toxic Wastes
- Flotation of Multivalent Ion Concentrating Algae
- Cyanide Fate in the Liquid Phase of Heaps.

Pyrometallurgy

- Control of Dross Formation During Lead Refining
- Mineralogy of Pyrometallurgical Feeds and Products
- Gas-Solid Reactions: Pyrophoricity
- Fluid Dynamics of Liquid Metal Atomization
- Kinetics of Gas-Slag Reactions
- High Temperature Gas-Particle Reactions
- Behavior of Oxygen and Sulfur in Complex Mattes
- Electrochemical Factors in Fused Salt Enhanced Reduction
- Mechanisms of Attack and Protection of Refractories
- Reaction Kinetics of Reduction Bath Smelting
- Control of Mixing by Submerged Gas Injection
- Flash Reaction Processes
- Fluid Flow and Heat Transfer in Submerged-Arc Slag-Cleaning Furnaces
- Thermodynamic Activities of Coppermaking Systems
- Rate Phenomena in the Flash Processing of Metal Dusts.

Respirable Dust

- Fracture Mechanics of Crack Propagation in Coal
- Mechanism of Lung Injury by Coal Mine Dusts
- Modelling of Longwall Face Ventilation
- Aerodynamic Diameter Analysis of Coal Dust
- Wetting Characteristics in Relation to Dust Abatement
- One-By-One Analysis of Coal Particles Using an Automated SEM with X-Ray Fluorescence
- Polymorphonuclear Leukocytes in Dust/Lung Interaction
- Dust/Lung Interaction in Coal Miners: Spirometry and Methacholine Challenge
- Biochemical Alterations in Mammalian Respiratory Mucus
- Dust Interaction with Nonhuman Primate Lungs
- Biologically Active Silica Using Photoacoustic Spectroscopy
- Analysis and Control of Diesel Particulates in an Underground Coal Mine
- Determination of Silica Particle Concentrations in Respirable Size Range.
- Morphometric Study of the Toxicity of Respirable Dust
- Release of Superoxide From Pulmonary Alveolar Macrophages

Respirable Dust (continued)

Tracheal Acoustic Impedance of Lung Air Passages
Knowledge-Based Expert System for Planning Mine Ventilation Systems
Dust Sampling and Analytical Strategies
Adhesion, Agglomeration, and Deposition of Respirable Dust
Augmentation of Dust Owing to Regrinding at the Face
Platelet-Activating Factor in the Etiology of Pneumoconiosis

SECRETARY'S ADVISORY COMMITTEE ON MINING AND MINERAL RESOURCES RESEARCH

The recommendations of this Advisory Committee, mandated by Public Law 98-409, are considered in the conduct of research and in the making of grants under this legislation. The Committee also is responsible for recommending the designation of new mineral institutes, for reviewing the eligibility of existing institutes and for preparing an annual National Plan for Research in Mining and Mineral Resources Research. At its September 30, 1987, meeting the Committee approved the 1987 grant award process, reviewed the research activities of the Respirable Dust Generic Mineral Technology Center, and drafted the 1987 update to the National Plan for Research in Mining and Mineral Resources. The Committee considered the question of continued eligibility of the Mineral Institutes based on their responses to a questionnaire that contained data on the extent to which individual Institutes met the four criteria of the Act. The Committee decided upon tentative standards relative to the criteria and established a procedure by which the Committee would make a final decision as to eligibility. The Committee also expressed its intention to review the utility and rationale for support of the present Generic Mineral Technology Centers and the possible need for new Centers.

Appendix "C"

Brief Biographies of Members of the Committee on Mining and Mineral Resources Research

Vic Aaron holds a Ph.D. and a M.S. in mechanical engineering from the University of Minnesota. He has been with the National Science Foundation since 1974 where he is currently Director of the Division of Mechanics, Structure, and Materials Engineering. From 1969-1974 he was a member of the Technical Staff of Bell Laboratories. He has also been Instructor, Department of Mechanical Engineering, at the University of Minnesota and is currently an adjunct professor at both Howard University and the University of Maryland. Prior to his graduate studies, he worked as an engineer with The Port Authority, Rangoon, Burma; Burma Oil Company; and Burma Oxygen Limited. He is a member of AAAS, ASME, and the American Society for Engineering Education. He has held visiting professorships at Cheng Chung Institute of Technology, National Cheng Kung University, and National Taiwan University. He is a co-founder and member of the Executive Committee of the Pacific Institute of Thermal Engineering and was an editor of the Journal of Heat Transfer, Transactions of ASME. He has been a member and officer of numerous engineering, technical, and search committees and was chairman of the Organizing Committee, International Symposium on Cooling Technology for Electronic Equipment. He was first appointed to the Committee on January 26, 1967.

John C. Calhoun, Jr. is Emeritus Deputy Chancellor for Engineering of the Texas A&M University System. He has also served Texas A&M as Vice-President for Academic Affairs, Vice-Chancellor for Development, Dean of Engineering, Dean of Geosciences, Director of their Sea Grant College Program, Director of the Engineering Experiment Station and Director of the Texas Engineering Extension Service. From 1937 to 1944 and from 1950 to 1953 he was a faculty member at the Pennsylvania State University, attaining the rank of full professor and Head of the Department of Petroleum & Natural Gas. From 1944 to 1950 he was a faculty member at the University of Oklahoma and Chairman of the School of Petroleum Engineering. He holds a Ph.D. in petroleum and natural gas engineering from Penn State and an honorary doctorate from Ripon College. He is a member of the American Society of Engineering Education, the Society of Petroleum Engineers of AIME, and the Marine Technology Society, in each of which he is a past president. He has been Executive Director and President, Gulf Universities Research Corporation, Chairman of the Board of the University Corporation for Atmospheric Research, a director of the Institute of Nautical Archeology and a member of the Texas Coastal and Marine Council. He was a member of the NAS/NRC Committee on Mineral Science and Technology and Chairman of the NAS Committee on Oceanography. He was Science Advisor, U.S. Department of Interior, 1963-65 and Acting Director of the Office of Water Resources Research in 1966. A member of the Presidential Task Force on Oceanography, he served as Chairman of the President's Santa Barbara Oil Spill Panel. He has served on numerous Federal Committees and Panels relating to technology, environment, and marine affairs. He is a member of the National Academy of Engineering. He was first appointed to the Committee on January 26, 1967.

John E. DeYoung, Jr. is Associate Chief of the U.S. Geological Survey's Office of Mineral Resources. Dr. DeYoung joined the USGS in 1972. During 1978-79, he served on the staff of the Policy Coordinating Committee for the Presidential Review of Nonfuel Minerals Policy. He is Executive Secretary of the International Strategic Minerals Inventory, a cooperative project of the USGS, the U.S. Bureau of Mines, and seven other mineral-resource agencies from five other countries. He received a B.S.E. degree with honors in civil and geological engineering from Princeton University, a M.S. in economic geology from the University of Michigan, and a Ph.D. in mineral economics from The Pennsylvania State University. He was Distinguished Military Graduate from Princeton University Army ROTC and served on active duty as a field artillery officer at Fort Sill, Oklahoma, and Nha Trang, Vietnam. While in Vietnam he was awarded the Bronze Star Medal. Dr. DeYoung is a member of the Society of Mining Engineers of AIME, the Society of Economic Geologists, and Sigma Xi. He is a past chairman of the Washington, D.C., Section of AIME and of its Mineral Economics Subsection. In 1967, he received the Mineral Economist of the Year award from the Subsection. He was appointed to the Advisory Committee April 10, 1980.

Robert J. Frehling is a graduate of Massachusetts Institute of Technology with a major in metallurgy. He is President and Chief Executive Officer of Mountain States Mineral Enterprises, Inc., which is in the business of providing engineering and construction services relating to minerals processing for the mineral industry. During World War II, he served with the Corps of Engineers, U.S. Army, in Burma. Prior to founding his company in 1969, positions held included Vice President and Manager of Business Development, Mining and Metallurgy Division, Parsons-Jurden Corporation; regional sales manager, Western Machinery Company; mill superintendent, St. Lawrence Fluorspar; plant metallurgist, Climax Molybdenum, and research engineer, Atomic Energy Commission. He is a recipient of the 1982 American Institute of Mining, Metallurgical and Petroleum Engineers (AIME), Charles F. Rand Gold Medal, and is a recipient of an AIME Distinguished Member Award. He was President of the Development Authority for Tucson's Economy (D.A.T.E.) and a member of the Board of Directors of the Tucson Chamber of Commerce. He served as Vice President of the Arizona Council of Economic Education and as a Director of the United Bank of Arizona. Presently, he is a member of the Tucson Airport Authority and serves on the University of Arizona Entrepreneurship Development Committee and on the Board of Pima Community College Foundation. He is on the Industrial Advisory Council for the College of Engineering, the College of Business and Public Administration, and the Wildcat Club of the University of Arizona. He is also on the advisory board of Tucson Tomorrow. He is a director on numerous civic and business organizations including service as National President of the Associated Builders and Contractors. He is a co-founder of the Mining Club of the Southwest (Tucson). He was appointed to this Advisory Committee August 8, 1984.

Walter H. Hibbard, Jr. is a graduate of Woolwich University and holds a doctorate in engineering from Yale University. He is a registered professional engineer in Connecticut, Virginia and Ohio. During the Second World War he served as Lieutenant in the U.S. Naval Reserve. He has been a University Professor of Engineering at Virginia Polytechnic Institute since 1974. Positions held prior to that include professor of engineering, Yale University; Manager, Metallurgical and Ceramics Research, General Electric; Research Laboratory; Director, Bureau of Mines; and Vice President, Owens Corning Fiberglass Corporation. He has received honorary degrees from Yale, Michigan Technological University, and Montana College of Mineral Science and Technology and has served on numerous Governmental, university, and National Academy of Sciences committees. He has been president of The Metallurgical Society and of the American Institute of Mining, Metallurgical and Petroleum Engineers and is a recipient of the Rossiter W. Raymond award and the James Douglas gold medal from the latter organization. He is a fellow of the American Academy of Arts and Sciences. A member of numerous professional and academic organizations, he is founding editor of the journal, Materials and Society. He was appointed to the Advisory Committee January 1, 1984.

Joseph E. Crowley holds a Ph.D. from the University of Washington, a masters degree from California State University and a B.A. from the University of Iowa. He has been President of the University of Nevada-Reno since 1978. He has been professor and chairman of the Department of Political Science at the University of Nevada and has served as a policy formulation officer for the Environmental Protection Agency. A member of the American Political Science Association, the Western Political Science Association, and the Northern California Political Science Association, he is author of the book "Democrats, Delegates, and Politics in Nevada: A Grassroots Chronicle of 1972," and a co-editor of the publication "Environment and Society." He was appointed to the Advisory Committee January 3, 1985.

Orme Lewis, Jr. is a graduate of the University of Arizona with a major in economics. He is Vice President of World Resources Company and Executive Vice President of Kellogg-Arizona, Inc., which companies and affiliates are in the business of reclaiming metals from waste solutions and sludges. He is also president of Applewhite Laflin & Lewis, a real estate investment and development firm. Mr. Lewis was elected votes to the Arizona State Legislature, from which he resigned as Senate Majority Leader in 1969 to serve as Deputy Assistant Secretary for Public Land Management in the Department of the Interior. He is a member of the Arizona State Power Plant and Transmission Siting Committee, Arizona Energy Resources Association, Desert Botanical Gardens, National Parks and Conservation Association and the Nature Conservancy. Mr. Lewis is a Director of the Arizona State University Foundation, Mom's Art Council, Phoenix Childrens Hospital, and Polycystic Kidney Research Foundation. He was first appointed to the Advisory Committee on March 15, 1982. He was elected vochair of the Committee October 15, 1984.

John D. Morgan holds B.S., M.S., Ph.D., and E.M. degrees in mining engineering from The Pennsylvania State University. He served as a Major in the Corps of Engineers, U.S. Army, in World War II and as a senior official of the National Security Resources Board, the Defense Production Administration, and the Office of Defense Mobilization in the Korean War period. He was a consultant to industry and government 1956-71, a member of the National Defense Executive Reserve for 20 years, and has been a senior official of the U.S. Bureau of Mines since 1971, having served as Acting Director for 3 years and currently as Chief Staff Officer. He is an Honorary Professor, Industrial College of the Armed Forces, National Defense University, a Distinguished Member of the Society of Mining Engineers-American Institute of Mining, Metallurgical, and Petroleum Engineers, a Fellow of the Society of American Military Engineers, and a member of the Scientific Research Society of America and the American Defense Preparedness Association (formerly Army Ordnance Association). In 1958-60 he served as a member of the National Academy of Sciences' Committee on the Scope and Conduct of Materials Research. He was also a member of the National Academy of Sciences' Committee on Mineral Science and Technology, 1965-1969, that made recommendations leading to the Mining and Minerals Policy Act of 1970 and the subsequent establishment of the State Mineral Institutes. Dr. Morgan has served as a member of the Advisory Committee since its establishment in 1978.

Carl L. Randolph is a graduate of Whittier College and holds masters and doctorate degrees in chemistry from the University of Southern California. He has served as a Lieutenant in the U.S. Naval Reserve. He is Vice Chairman of the Board of Directors of U.S. Borax and Chemical Corporation having served as President from 1949 to 1967. He has been a Director of the corporation since November 1960. Between 1963 and 1969, he served as Assistant to the President, Vice President of Marketing Development, and Executive Vice President of U.S. Borax and Chemical. Between 1957 and 1969, he served successively as Manager of Inorganic Borax Research, Associate Director of Chemical Research, Vice President, and Chairman of the Board of U.S. Borax Research Corporation, a subsidiary of United States Borax and Chemical. He was Principal Chemist with Aerojet General Corporation from 1949-1957. He is Chairman, Board of Trustees, Whittier College; Director, Potash Institute of North America; Director, Northwest and Manufacturers Associations; and Chairman of the American Mining Congress Mining and Minerals Education Committee. He is also a member of the AMC Surface Mining Committee, the American Chemical Society, the Newcomen Society, and the Advisory Board of the Knowlton Educational Council. He was appointed to the Advisory Committee June 4, 1984.

Roy L. Harvey received the professional degree of geological engineer in 1936 and the master of science degree in 1941 from the Colorado School of Mines and the Ph.D. degree in Engineering Sciences from the University of California at Berkeley in 1946. Since 1949, he has been professor of geological engineering at the University of Missouri-Rolla and became Dean of the School of Mines and Metallurgy in 1981. Prior to his appointment at the University of Missouri he was Chief of Earth Sciences for the Missouri Region of the Federal Water Pollution Control Administration (1967-1969) and Research Geologist and Engineer for the Division of Water Supply and Pollution Control of the U.S. Public Health Service (1964-1967). He worked for several energy companies in the western U.S. and Central America during 1934-38. Since 1969, he has been consultant to numerous Governmental agencies, economic organizations and private companies. He is a member of the American Association of Petroleum Geologists, American Institute of Professional Geologists, Association of Engineering Geologists, Geological Society of America, National Water Well Association, National Society of Professional Engineers, and Missouri Society of Professional Engineers and is a registered professional engineer and certified professional geological scientist. He was appointed to the Advisory Committee January 2, 1985.

James W. Ziglar holds a B.A. from George Washington University and received his Juris Doctor from George Washington University National Law Center in 1972. He is a member of the bar in Arizona, Virginia, New York and the District of Columbia. He is Assistant Secretary for Water and Science, U.S. Department of the Interior. Prior to his nomination as Assistant Secretary, Mr. Ziglar was employed as Managing Director of the Municipal Investment Banking Department of Paine Webber. He also has been associated with Dillon, Read & Company, New York, as Senior Vice President of the Public Finance Department; O'Connor, Cavanagh, Anderson, Westover, Killingsworth & Beshears, Phoenix, Arizona, as Partner-in-Charge of the Public Finance Department; and Hodge Rose Guthrie Alexander & Forden, New York, as Associate Attorney in the Public Finance Department. Before entering the financial services industry, Mr. Ziglar served as Law Clerk to Associate Justice Harry A. Blackmun of the United States Supreme Court. He also served as Special Assistant for Legislative and Public Affairs in the U.S. Department of Justice and as an aide to former Senator James G. Eastland. He is a Registered Naturalist. Secretary Principal and has served as a member of the Board of Directors of the National Water Resources Association and as Chairman of its Financial Council. He was appointed vochair of the Advisory Committee on May 12, 1987.

MINERAL INSTITUTE FUNDING
Fiscal Years 1978-1987

University of Alabama	2,666,731
University of Alaska	2,018,987
University of Arizona	2,106,826
University of California-Berkeley	2,579,054
Colorado School of Mines	2,560,795
Georgia Institute of Technology	1,504,906
University of Idaho	2,722,453
Southern Illinois University-Carbondale	3,031,257
Purdue University	2,703,067
Iowa State University	1,565,281
University of Kentucky	2,976,936
Louisiana State University	1,393,710
Massachusetts Institute of Technology	2,815,028
Michigan Technological University	2,170,991
University of Minnesota	2,935,105
University of Mississippi	1,738,918
University of Missouri	4,273,601
Montana College of Mineral Science & Tech.	2,399,725
University of Nevada-Reno	3,882,798
New Mexico Institute of Mining and Tech.	2,666,148
Columbia University	207,830
University of North Dakota	1,517,728
Ohio State University	2,624,947
University of Oklahoma	1,720,366
Pennsylvania State University	6,737,033
South Dakota School of Mines	1,589,004
University of Texas	1,689,821
University of Utah	5,983,209
Virginia Polytechnic Institute & State Univ.	3,729,905
University of Washington	1,374,185
West Virginia University	5,589,556
University of Wyoming	1,523,406
TOTAL	$ 84,999,307

Exhibit "D"

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of Rule XXVI of the Standing Rules of the Senate, the Committee notes the following changes in existing law made by H.R. 3977, as reported (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, and existing law in which no change is proposed is shown in roman):

To amend the Act to Reauthorize the State Mining and Mineral Resources Research Institute Program

(98 Stat. 1536)

(a)(1) There are authorized to be appropriated to the Secretary of the Interior (hereafter in this Act referred to as the "Secretary") funds adequate to provide for each participating State [$300,000 for the fiscal year ending September 30, 1985, and] $400,000 *for the fiscal year ending September 30, 1990, and* [to each participating State] for each fiscal year thereafter for a total of five years, to assist the States in carrying on the work of a competent and qualified mining and mineral resources research institute or center (hereafter in this subchapter referred to as the "institute") at one public college or university in the State which meets the eligibility criteria established in section 10.

[(2)(A) Funds appropriated under this section shall be made available for grants to be matched on a basis of no less than one and one-half non-Federal dollars for each Federal dollar during the fiscal years ending September 30, 1985, and September 30, 1986, and no less than two non-Federal dollars for each Federal dollar during the fiscal years ending September 30, 1987, September 30, 1988, and September 30, 1989.]

(2)(A) Funds appropriated under this section shall be made available for grants to be matched on a basis of no less than two non-Federal dollars for each Federal dollar.

(b) It shall be the duty of each institute to plan and conduct, or arrange for a component or components of the college or university with which it is affiliated to conduct research, investigations, demonstrations, and experiments of either, or both, a basic or practical nature in relation to mining and mineral resources, and to provide for the training of mineral engineers and scientists through such research, investigations, demonstrations, and experiments. The subject of such research, investigation, demonstration, experiment, and training may include exploration; extraction; processing; development; [production of mineral resources;] *production of fuel and non-fuel mineral resources;* mining and mineral technology; supply and demand for minerals; conservation and best use of available supplies of minerals; the economic, legal, social, engineering, recreational, biological, geographic, ecological, and other aspects of mining, mineral resources, and mineral reclamation. Such research, investigation, demonstration, experiment and training shall consider the interrelationship with the natural environment, the varying conditions and needs of the respective States, and mining and mineral resources research projects being conducted by agencies of the Federal and State Governments and other institutes.

SEC. 2. (a) [There is authorized to be appropriated to the Secretary $10,000,000 for the fiscal year ending September 30, 1985.] *There is authorized to be appropriated to the Secretary $15,000,000 for the fiscal year ending September 30, 1990, and for each fiscal year thereafter for four additional years, which shall remain available until expended.*

[This amount shall be increased by $1,000,000 for each fiscal year thereafter for four additional years, which shall remain available until expended.] Such funds when appropriated shall be made available to institutes to meet the necessary expenses for purposes of—

(1) specific mineral research and demonstration projects of broad application, which could not otherwise be undertaken, including the expenses of planning and coordinating regional mining and mineral resources research projects by two or more institutes; and

(2) research into any aspects of mining and mineral resources problems related to the mission of the Department of the Interior, which are deemed by the Committee to be desirable and are not otherwise being studied.

* * * * * * *

SEC. 6. (d) There are authorized to be appropriated [after September 30, 1984,] such sums as are necessary for the printing and publishing of the results of activities carried out by institutes under this subchapter and for administrative planning and direction, but such appropriations shall not exceed $1,000,000 in any single fiscal year.

* * * * * * *

SEC. 9. (a)(7)

[not more than six other persons who are knowledgeable in the fields of mining and mineral resources research, including two university administrators involved in the conduct of programs authorized by section 301 of the Surface Mining Control and Reclamation Act of 1977, two representatives from the mining industry, a working miner, and a representative from the conservation comunity. In making these six appointments, the Secretary shall consult with interested groups.]

seven other persons who are knowledgeable in the fields of mining and mineral resources research, including two university administrators involved in the conduct of programs authorized by this Act, three representatives from the mining industry, a working miner, and a representative from the conservation community. In making these seven appointments, the Secretary shall consult with interested groups.

* * * * * * *

(c) The Committee shall develop a national plan for research in mining and mineral resources, considering ongoing efforts in the universities, the Federal Government, and the private sector, and shall formulate and recommend a program to implement the plan utilizing resources provided for under this subchapter. [The Committee shall submit such plan to the Secretary, the President, and the Congress on or before March 1, 1986, and shall update the plan

annually thereafter.] *The Committee shall submit such plan to the Secretary, the President, and the Congress on or before March 1, 1986, and shall submit an annual update of such plan by January 15, of each calendar year.*

* * * * * * *

SEC. 10. (b) [Notwithstanding the provisions of subsection (a) of this section, those colleges or universities which, on August 29, 1984, have a mining or mineral resources research institute program which has been found to be eligible pursuant to title III of the Surface Mining Control and Reclamation Act of 1977 (91 Stat. 445) shall continue to be eligible pursuant to this subchapter for a period of four fiscal years beginning October 1, 1984.] *Notwithstanding the provisions of subsection (a), those colleges or universities which, on the date of enactment of this Act, have a mining or mineral resources research institute program which has been found to be eligible pursuant to this Act shall continue to be eligible pursuant to this Act subject to review at least once during the period authorized by this Act, under the provisions of section 10(a) of this Act.*

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